

Original article

Patient and Staff Perspectives on the Use of a Computer Counseling Tool for HIV and Sexually Transmitted Infection Risk Reduction

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Abstract

Purpose: To explore use of an interactive health communication tool- "Computer Assessment and Risk Reduction Education (CARE) for STIs/HIV."

Methods: This was a mixed method study utilizing participant observation and in-depth interviews with patients (n = 43), and focus groups with staff (5 focus groups, n = 41) from 5 clinics in 3 states (1 Planned Parenthood, 1 Teen, 2 STD, and 1 mobile van clinic). Data were managed using Atlas.ti. Inter-rater reliability of qualitative coding was .90.

Results: Users were 58% nonwhite with mean age 24.7 years (74% < 25). Patients could use CARE with minimal to no assistance. Time for session completion averaged 29.6 minutes. CARE usefulness was rated an average of 8.2 on an ascending utility scale of 0 to 10. Patient themes raised as strengths were novelty, simplicity, confidentiality, personalization, and plan development, increased willingness to be honest, lack of judgment, and a unique opportunity for self-evaluation. Staff themes raised as strengths were enhanced data collection, handout customization, education standardization, behavioral priming, and expansion of services. Patient limitation themes included limited responses and lack of personal touch. Staff limitation themes were selecting users, cost, patient-provider role, privacy, and time for use.

Conclusions: CARE was well-received and easily usable by most (especially 18–25-year-olds). Patient and staff perceptions support the use of CARE as an adjunct to usual practice and as a method to expand services. Honesty, reduced time constraints, and lack of judgment associated with CARE appeared to enhance self-evaluation, which may prove an important component in moving patients forward in the behavior change process. © 2007 Society for Adolescent Medicine. All rights reserved.

Keywords:

HIV; Sexually transmitted disease; Sexually transmitted infection; Behavior; Risk reduction; Computer; Qualitative research

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In the United States, more than 65 million people are currently living with an incurable sexually transmitted infection (STI) [1] and an estimated 18.9 million people become infected with one or more STIs annually [2]; approximately half of new infections are incurable [1]. There are approximately 40,000 new HIV infections occurring in the United

States every year and an estimated one third of those currently infected are unaware of their status, a factor that contributes to related morbidity and mortality [1,3]. Innovative responses are critically needed to reduce the negative impact of STI and HIV infection in the United States.

STIs disproportionately affect the under 25-years-of-age population [4–6]. Prevention of STIs including HIV is an important personal and public health endeavor. Reducing sexual risk taking behavior and increasing screening and treatment of STIs are two ways to reduce the spread of disease. The Centers for Disease Control and Prevention (CDC) historically has recommended client-centered HIV prevention counseling that focuses on an in-depth exploration of personal risk, consideration of ways to reduce risk, and a commitment to a single, explicit step to reduce risk behavior [7]. Despite recommendations for STI/HIV risk assessment, counseling, and testing in sexually active populations, research indicates that clinicians do not consistently or adequately adhere to these recommendations even in adolescent [8–10] or reproductive health care settings [4]. Studies report that this is the result of several factors including clinician time constraints, competing demands, lack of training, and comfort level with sexual health discussions, as well as reduced health care budgets [4,11,12].

Technology-based interactive health communication tools have been used to provide counseling in clinical settings to promote behavior change. Brief interactive face-to-face counseling and video-based counseling have been shown to decrease STI transmission [12–14]. Studies support computer technology, including web-based interventions, as being effective for behavior change in STI reduction [15], smoking cessation [16], dietary change [17], and diabetes management [18,19]. Research indicates that audio–computer-assisted self-interviewing (A-CASI) may be a particularly

appropriate method for conducting risk reduction counseling and sexual risk assessment with a high-risk young adult population. A-CASI has been shown to increase respondent self reporting of stigmatized behavior such as same-sex behavior or injection drug use [20,21] or anal intercourse [21]. A-CASI may help identify persons who are at greater risk for sexually transmitted disease due to increased willingness to report sensitive and high-risk behaviors [20,22,23]. In addition, the under age 25 population (the group with the highest rates of STIs) is more likely than older age groups to have attained computer skills [24].

Computer Assessment and Risk Reduction Education (CARE) for STIs/HIV is a multimedia, audio narrated, interactive health communication tool (5th grade reading level) designed to increase sexual risk assessment and risk reduction counseling based on the CDC’s evidence-based counseling protocols [25] and using the Integrative Model of Change [26,27]. It provides in-depth, personalized sexual risk assessment, tailored feedback based on the user’s responses, behavioral skill-building videos, and the development of a specific, realistic risk-reduction plan (Figure 1) [28]. The purpose of this study was to explore patient and staff perceptions of CARE, specifically usability and perceived strengths and limitations.

Methods

The study used a mixed method qualitative nonrandom design to explore various aspects of implementing CARE in a variety of clinic settings. Three qualitative methods for data collection were used in the study: participant observation and in-person interviews with patient users, and focus groups with clinic staff. All data were collected anonymously, without identifiers.

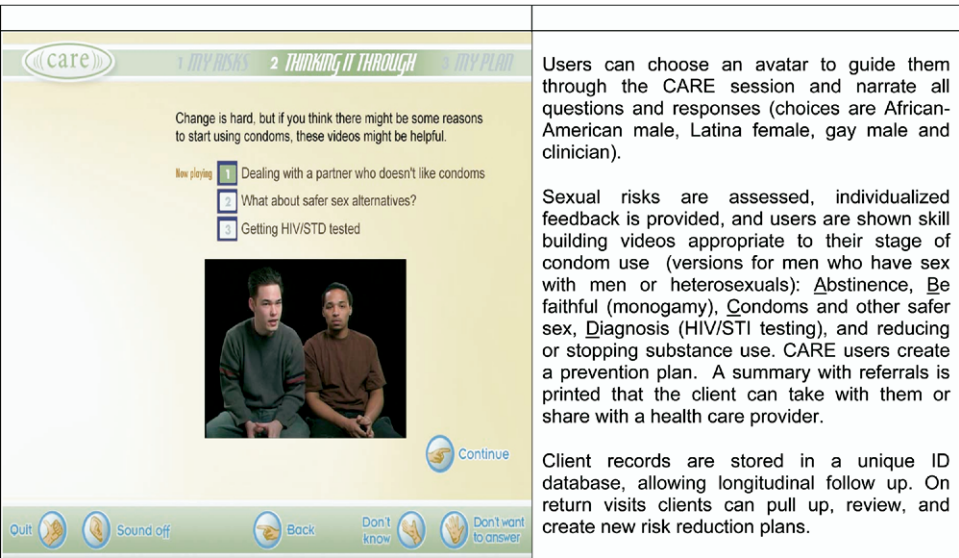


Figure 1. CARE computer counseling tool screen shot.

Table 1
Demographics of patients by site

| | WA planned parenthood | IN STD clinic | WA teen clinic | WA STD clinic | CA mobile van | Overall |
|----------------------|-----------------------|---------------|----------------|---------------|---------------|--------------|
| Mean age (range) | 22.8 (18–26) | 31 (21–54) | 18.9 (18–20) | 32.7 (18–52) | 21 (18–27) | 24.7 (18–54) |
| Race/ethnicity: | N = 9 | N = 9 | N = 8 | N = 7 | N = 10 | N = 43 |
| Caucasian | 5 | 5 | 3 | 3 | 2 | 42% |
| African American | 0 | 3 | 2 | 4 | 3 | 28% |
| Asian | 2 | 0 | 0 | 0 | 0 | 5% |
| Hispanic | 2 | 0 | 3 | 0 | 5 | 23% |
| Other | 0 | 1 | 0 | 0 | 0 | 2% |
| Gender | | | | | | |
| Male | 4 | 7 | 1 | 5 | 0 | 40% |
| Female | 5 | 2 | 7 | 2 | 10 | 60% |
| Computer experience: | | | | | | |
| None or rare | 0 | 0 | 0 | 0 | 1 | 2% |
| 1–2 times/week | 1 | 1 | 0 | 4 | 0 | 14% |
| Almost daily | 0 | 2 | 3 | 3 | 6 | 33% |
| Daily use | 8 | 6 | 5 | 0 | 3 | 51% |

Data were collected between November 2004 and June 2005 from five clinics in Washington, California, and Indiana (one Planned Parenthood, one teen clinic, two STD clinics, and one mobile van). These settings were chosen because they serve populations at increased risk for STIs/HIV and a diverse range of users [29].

Patient users were selected by convenience sampling. Sampling was continued until saturation of themes was reached ($n = 43$ participants). Inclusion criteria were: able to understand spoken English, ≥ 18 years of age, and able to give consent. Patients were recruited in the waiting room, study was described and conducted in private area following verbal consent, and no individual identifiers were included. Participants received \$25 reimbursement. Patients participated in the patient observation and interviews. Participant demographics by study site are shown in Table 1. The average age of participant was 24.7 years, with a range of 18 to 54 years (74% were < 25 years).

Data consisted of extensive field notes taken by two researchers (S.M., A.S.) during observation sessions of subjects using CARE on a tablet computer. Following session completion, users were asked open-ended and rating scale questions about the experience and utility of the tool. All field notes were typed as soon as possible (within 24 hours) after sessions to enhance accuracy.

Staff were selected for focus groups by purposive sampling to obtain a cross section of clinical roles (5 focus groups, $n = 41$). Inclusion criteria were: paid employee of the clinic at any time throughout the duration of the study, able to understand spoken English, ≥ 18 years of age, and able to give consent. A single focus group was held at each clinical site. Staff received \$25 reimbursement. Focus groups averaged eight participants (range 5–13). Participants included patient service representatives (12), clinicians (25), and counselors (4). All groups had at least one representative from administration, and clinician/counselor.

Staff verbally consented for participation at the beginning of the focus group, and no identifying information beyond site of group and clinic role was included. Data consisted of a court reporter's verbatim transcripts. Focus groups were led by a trained moderator (S.M.) and followed a topic guide designed to explore current clinical practice for sexual risk assessment and counseling, demonstration of the CARE software tool, and elicitation of clinical staff reactions, perceptions, and beliefs regarding the tool.

In participant observation data, descriptive statistics regarding time for use, perception of length of product, and usefulness were calculated. Transcripts from interviews and focus groups were independently reviewed by two investigators (S.M., A.S.) to identify major themes around strengths and limitations. ATLAS.ti (Scientific Software Development GmbH, Berlin, Germany) was used for data management. Investigators met to develop a code book, and differences of opinion about the meaning of specific passages were discussed and resolved. Once the code book was established, each investigator independently coded a previously uncoded session to evaluate inter-rater reliability (.90).

The study was approved by the University of Washington Human Subjects Division, Minimal Risk Committee, Certificate of Exemption #04-4879-X/A.

Results

Study participants self-rated their computer use as none/very rarely (2%), 1–2 times a week (14%), almost daily (33%), or several hours most days (51%). Most study participants had never used a tablet computer prior to participation in the study ($n = 33/43$), and none owned a tablet.

CARE took an average of 29.6 minutes (range: 17–46) for participants to complete. The majority of participants required little to no assistance throughout their test session. This was especially true for patients who were under age 25 and used computers “almost daily” to “daily.”

Table 2
CARE computer counseling usability themes and representative participant quotes

| Themes | Qualitative data |
|--------------------------------|---|
| Perceived Strengths: | |
| Novelty and simplicity | “Super cool. Probably if afraid to talk this will help. Super simple, not frustrating, nice person talking, soothing voice . . .” “New technology is just enough to keep me amused. Sounds silly but paperwork can distract. This focuses more.” |
| Honesty and lack of judgment | “Easier answering on computer than face-to-face. Can trust, be more comfortable, be more truthful, you lie when talking to a doctor . . .” “A computer is much better than a person. People are more embarrassed with a person and will answer anything to a computer” |
| Enhanced self-evaluation | “I like after the assessment—it repeats what you had answered. Serves as a wakeup. You are saying it but when you read it—you think that’s dumb! Why am I doing it? It makes you evaluate self when they reiterate what you answered.” “Awesome little program. A wake up call/reality check but it was not uncomfortable. I was comfortable but uncomfortable to see I have done certain things that put you at risk. Makes you want to go get tested which is good.” “On computer you can go at your own rate. With person they get anxious if you don’t answer quick enough . . .” |
| Personalization | “Asks questions better than pamphlets. It tells you to answer own questions about your health and what you’ve been doing for yourself. You are answering for yourself” “Tour guide- liked you could pick. A lot of people, like myself, I’d rather have a man doctor . . . So, you can pick what is easier for you . . .” |
| Plan development | “At end, what can you do? Having plan to carry with you is important.” “They may be apprehensive but get report—even just the bottom stuff on report alone would be helpful even if nothing else. This is so helpful . . .” |
| Perceived Limitations: | |
| Limited flexibility or choices | “Need option ‘I’ll come back in 2 weeks.’ I guess I’ll put negative because I don’t think I have it . . .” “Would like more involvement and freedom to respond on your own, not just set responses . . .” |
| Lack of personal touch | “Person can relate, sympathize, the way to go through some of the questions, would like to elaborate on some . . .” “If you have questions, am I to ask the computer? It’s not going to talk back.” |

Patients were asked to rate the tool from 0 to 10 as to its usefulness for them. Overall, participants gave an average rating of 8.3 (range: 3–10). Participants rated the length of a CARE session as too short (2%), just right (72%), and too long (26%).

Patients were asked open-ended questions regarding their experience using CARE. Themes and representative quotes are illustrated in Table 2.

Patient-perceived strengths of program

Novelty and simplicity

Participants indicated that it was more fun to enter data into a computer than on paper, and liked the fact that they could tap on the screen to enter responses and could hold the tablet in their lap. Patients reported the CARE language was clear and understandable. Most patients appreciated that the words were matter-of-fact (such as “anal,” “penis,” “vagina”).

Honesty and lack of judgment

Participants commented that the computer format promoted honest responses. Some perceived their clinicians would judge them by their answers or be shocked by their prior sexual experience and drug use. Most patients felt that the computer was unable to make judgments and this made it easier to answer honestly. Some patients pointed out that the computer gives feedback based on their answers to questions and thus if they did not answer honestly, the feedback would be useless.

Enhances self-evaluation

Many participants indicated that the computer enhanced self-evaluation, by allowing them to be more honest and less concerned about being judged, and because the computer placed less time pressure on them than answering a clinician would. Patients remarked that seeing what they had answered in writing (e.g., an actual number of sexual partners) made them think differently about their risk behaviors.

Personalization

Some patients explicitly compared the tool to educational pamphlets and felt CARE was better because it related to their specific behaviors and risks. Components of CARE were included to give patients options and control in their experience. For example, patients are allowed to select a guide (counselor analog or “avatar”) who is then present on future screens with varying facial expressions and appropriate audio. Many patients thought this made the experience more personal, that it increased their comfort level and humanized the experience.

Plan development

Many patients felt the risk reduction plan development was important and for many, was a novel experience. Patients perceived this as a motivator for behavior change and they appreciated the summary printout to remind them of their goals.

Patient-perceived limitations of program

Limited flexibility or choices

The most common limitation mentioned by patients was the difficulty for a software program to include all possible options or choices. Some patients wanted to see a wider range of options but other patients wanted the freedom to respond with their own answers instead of a set of responses (of note, users were often given the option of writing in additional responses but this was rarely utilized).

Lack of personal touch

Another theme discussed by patients was the lack of personal touch with a computer. It is important to note that this theme came up both as a strength and a weakness. Some people felt a computer could not sympathize and relate to what a patient is experiencing. Some patients wanted this personal component.

Staff focus groups

Staff focus groups were conducted to explore staff perceptions of the strengths and limitations of the CARE program. Table 3 lists the common themes that emerged.

Staff-perceived strengths of program

Enhance data collection

All groups discussed the volume of paperwork and screening questions that patients are required to complete. If CARE could be integrated into the existing (or developing) electronic health records, then it could reduce the time required by staff to complete data entry.

Customization of printout

Staff discussed this in two ways. First, they highlighted the fact that having something in writing to take away from a visit or session would allow patients to think about it in the future. Second, they highlighted the tailoring component of CARE. Patients would have a printout relevant to them and thus, they felt, be more likely to address a patient's true needs.

Standardize education

Staff acknowledged that due to time demands, some patients did not always get as much counseling as they might need. CARE could be used at these times to improve consistency of counseling. In one setting, it was mentioned that some patients come to the clinic for court mandated HIV testing and CARE could provide a more standard educational and counseling component.

Expansion of services

Clinics proposed several ways in which CARE could expand current services. When counselor availability was raised as a significant barrier to providing HIV testing and counseling, groups discussed that CARE could provide these services. CARE in the waiting room may be a way to reach out to the partners or friends of patients. If a "non-patient" used the tool, it may be a way to provide outreach to the patient's commu-

nity, identifying others who may need testing. Other clinics had outreach services to juvenile detention centers or community events and saw CARE as a way to provide increased risk assessment and counseling in those settings.

Behavioral priming

Staff perceived that if patients used CARE in the waiting room, prior to a visit with a health provider, patients would be able to start thinking about and recognizing their risk. Patients would also be able to receive some information and consider a plan for risk reduction. Staff discussed how the computer program may help patients appreciate that staff are not just "prying into their business" but actually trying to get important information when they ask personal questions. Staff felt they would then be able to focus the patient-provider time on answering questions, probing deeper into areas that the patient wanted to pursue, reinforcing the patient's chosen plan for behavior change, and performing any required or requested testing.

Staff-perceived limitations of program

Selecting users

Staff raised concerns about patient's language, literacy, and other health problems as possible barriers to use of CARE. All focus groups discussed that many of their patients are non-English speaking and it would be particularly useful if CARE was in different languages.

Literacy, both computer and reading, were discussed

Staff felt younger, more computer-savvy patients would be more likely to use the program, and they recognized these younger patients were at greater risk for STIs. Staff also envisioned problems for patients who were using alcohol or drugs or who had mental health disorders.

Cost

Cost was primarily discussed as a limitation in regard to the needs of the clinic and the introduction and maintenance of CARE. Several clinics discussed that they did not even have the funds to provide computers for their employees. Staff had fears that computers would be damaged or stolen.

Privacy concerns

Most of the groups raised the issue of crowded waiting rooms with limited privacy. They thought it might require a private setting for patients to feel comfortable and to prevent potential stigma associated with a "sexual program." They offered two potential solutions for the perceived issue of labeling; create additional software programs for the tablet that would assess less socially stigmatized behaviors and/or put the software program in a kiosk format with other programs.

Time for use

Staff universally thought that it would be challenging to find an uninterrupted 30-minute session that would fit into already established patterns of clinic flow. In clinics where wait times were long, this was seen as less of an issue. Staff

Table 3
CARE computer counseling themes and representative quotes from staff focus groups

| Themes | Qualitative data |
|-------------------------------|--|
| Perceived Strengths: | |
| Enhance data collection | <p>“If it is going to be replacing the risk assessment form, I would be all for it because we spend a lot [of time on] duplicate data entry that would eliminate a lot of mistakes . . .”</p> <p>“I mean they will answer these questions. And then, here we are, they won’t give it to us, so we ask the same questions again . . .”</p> |
| Customization of printouts | <p>“I love the idea that they have a printout and they can walk away with something . . .”</p> <p>“Because they might be more honest with a computer. They might think about what they are saying. And they are going to actually take a paper with them potentially that gives them some ideas . . .”</p> |
| Standardize education | <p>“It’s kind of assumed that as they’re going to clinic, they’re going to get that education. But that would be a little bit more formal—formalized process . . .”</p> <p>“In the private doctor’s offices, I don’t think that they are even anywhere near giving the proper education . . . for educational purposes it has to be in our private doctors offices where I think our patients are suffering.”</p> |
| Expansion of services | <p>“Do you want an HIV test? People mark yes . . . In theory, we could hand them that, fill this out, it gets printed out, great, draw your blood and off you go . . .”</p> <p>“I know we’ve got a lot of down time for our patients prior to them actually talking to us . . . If we can see some changes just in the short time from when we meet them and ask them questions about how they view their own risk . . . I think that process could really be extended”</p> |
| Behavioral priming | <p>“A lot of times when we interview patients, they feel like we’re trying to meddle in their business. So, maybe if they could fill that out before they’ve seen it, it makes them realize their own risks . . .”</p> <p>“Because the conversation is a lot more easier for people who have done some research to start. So for them to get a lot of information in a very basic manner and then call us for more information, that would be good . . .”</p> |
| Simplicity of system | <p>“I thought I could get through life being computer illiterate but they are dragging me kicking and screaming to learn how to use these things. So is this very simple, where you just have to touch an answer and move on? I mean nothing else you have to do? You pick something and touch it . . . ?”</p> <p>“And kids are into computer games. They are so computer literate. I think that group would love it. Teens and college students, it would be easy for them. Because they are so much quicker at it . . .”</p> |
| Perceived Limitations: | |
| Selecting users | <p>“It works better for younger kids because they might be embarrassed to talk to a clinician about their previous sexual activities, as opposed to doing it on a computer . . .”</p> <p>“The type of people we are dealing with, you know, some of them is drunk, you know, loaded, things like that. That’s a concern I have . . .”</p> |
| Cost | <p>“Would we have to have a tablet for every patient? Because we can’t even afford computers for every nurse so far . . .”</p> <p>“You would need to secure it in like steel, honest to god. And it would need to have a very special cover on it . . .”</p> |
| Privacy concerns | <p>“Our waiting room is jam packed, standing room only a lot. I think it would be very difficult for somebody to fill this out and use it properly in that kind of environment . . .”</p> <p>“One way I could see envisioning avoiding some of the privacy problems and the security problems is instead of having these mobile units, if you had them physically secured to some sort of stand where people could sit in the chair with a curtain pulled . . .”</p> |
| Time for use | <p>“Well, in clinic . . . they do have a lot of downtime. But it’s kind of broken up, you know, by other things. So it would be—they would either have to take it with them to do it or in some way break it up . . .”</p> <p>“I think 15 minutes, I’ve been kind of thinking, would be much more reasonable than 30 . . .”</p> |
| Local modifications | <p>“If it’s going to be possible to sort of change the instrument so that like issues we face, like MSM or in Seattle, Wa we probably have a different set of issues than those in Grand Rapids MI or Cheyenne Wy. . .”</p> <p>“Spanish would be great. There’s so many languages, we have 26 or something . . .”</p> |
| Conflict over computer role | <p>“What I don’t think it can do is replace the actual spontaneity, creativity, the warmth, the connection that you feel with a human being that can be a huge motivator . . . And things like that can never be replaced . . .”</p> <p>“If you computerized everything and put up that barrier, I don’t know, would it increase awareness so then decrease HIV transmission, or would it create another barrier that computer usage has created where we don’t have to talk to people? We have this wall up . . .”</p> |

believed patients would be unwilling to spend 30 minutes using a program. When pushed to propose a time, staff felt would be more congruous with the clinical setting, a 15–20 minute range was proposed.

“Local” modifications

Clinic staff perceived a potential future advantage of a software program is the ability for local modification. They

felt there would be advantages if clinics were able to request modules that could target specific issues associated with risk in their community, such as methamphetamine use.

Conflict over computer role in patient provider relationship

Staff expressed conflicting feelings about how a computer assessment and counseling tool would affect the patient-provider relationship. While staff saw benefit to the

priming affect, they raised concern regarding a computer replacing a human interaction. Staff saw the patient-provider visit as an opportunity for patients to practice sexual health communication skills and felt the relationship to be a motivator for behavior change.

Discussion

This pilot study showed the feasibility of using CARE sexual risk reduction computer counseling in a variety of clinic settings. Patients found the tool useful and acceptable. Clinical staff demonstrated enthusiasm and a recognized place for a new interactive health technology to improve sexual risk assessment and counseling. There were no significant differences by clinic site among users. Younger patient age appeared to be associated with ease of using CARE, consistent with prior research [30] and reassuring, given that this population is at highest risk for STI. Despite staff concern regarding CARE session length, patients perceived the session time to be acceptable.

Patients acknowledged they were likely to be more honest with the computer risk assessment than with a counselor, which confirms prior study findings that computers can increase willingness to disclose sensitive information [22,23]. Patients raised the issue of sometimes feeling judged by clinic staff and felt the computer removed this barrier. The sense of judgment may relate to patient perceptions of stigma associated with their sexual behaviors rather than actual attitudes or behaviors of clinical staff.

The benefits of patients being more honest with computer-assisted instruments are often discussed from the data collection or provider viewpoint, i.e., the improved willingness of patients to disclose to provider or survey researcher. However, this study raises the question of whether there are unique aspects of the computer session itself—including privacy and reduced time pressure as well as social desirability bias—that may increase a patient's ability to self-evaluate behavior. Self-evaluation is described as a process of change within the transtheoretical model and is felt to mediate progression from contemplation to preparation for action. Self-evaluation combines cognitive and affective assessments of one's self-image with a behavior [31]. Reduced time pressure allowed patients to more fully consider the question and think about their answers. It may take a few moments, for example, to consider how many sexual partners a patient has actually had in a given time frame. The computer medium allows users freedom from concern about a person's reaction or judgment of their answer, enhancing reflection on their behaviors. Finally, the patient *sees* and/or *hears* their own answer presented back. This visual representation of number of sexual partners or written presentation of their risk appeared to be powerful for some patients. The opportunity for self-evaluation may move patients along in their willingness or readiness to change. The longitudinal randomized trial of the CARE tool incorporates

stage of change measures and so will be able to evaluate this process empirically.

Staff perception of health technology is important in the dissemination of health technology [32]. CARE was compatible with staff beliefs regarding a need and benefit to expansion and standardization of risk assessment and counseling services beyond what clinicians are able to provide currently. CARE was seen to provide systems benefits if integrated into electronic records by reducing time for data entry and improving accuracy of data entry.

Staff perceived the tool may have an impact on the patient-provider relationship and they primarily saw the tool as an adjunct to the relationship instead of as an independent stand-alone program. They had conflicting views regarding technology and communication regarding sexual health, raising the question of whether the tool would prove efficacious. It may be that the program will be most beneficial for patients in a certain stage of readiness to change, whereas the personal interaction with a provider may be most beneficial for patients in a different stage. An ongoing randomized controlled trial will help answer this concern.

Staff raised concern regarding cost. With computerized technology, the outlay of expense for program, tablets, and up-keep must be balanced against potential cost savings and increased services by reducing staff time for data collection and data entry. Cost can also be considered on a larger scale as the societal cost of development and implementation of the CARE program is balanced against potential cost savings by reducing costs of staff resources, STIs, and their sequelae.

Limitations of this study include that data may not be generalizable to all patients at the represented sites or to other clinic populations. Patients and staff who declined to participate or who were not approached about participating may have had different views or experiences with the program than those who participated. The design specifically included five distinct clinic settings in three regions of the country that each serves populations at increased risk for STIs and HIV. Therefore, the results are more likely to be generalizable to public health and safety net provider settings in urban areas than private practices or rural settings. However, the fact that many themes and issues were universally identified at all sites supports some generalizability. The study was not designed to specifically identify differences based on age, race/ethnicity group, gender, or region of country. However, the study had a wide diversity of age, race/ethnicity, and computer experience, and patterns of use by age emerged, which can be explored in more depth for refining the patient selection process. While every attempt was made to encourage divergent views, staff may not have felt comfortable expressing opinions that differed from their colleagues in the focus group setting.

In conclusion, utilization of an evidence-based computer counseling intervention may enhance STI risk reduction counseling. Patient interview and staff focus group data

revealed that CARE is an acceptable and feasible method to enhance current clinic-based screening and counseling options. Computer-delivered HIV/STI counseling is an innovative approach that may enhance and hasten efforts to reach national goals of sexual risk assessment and counseling to reduce STI and HIV infections.

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References

- [1] CDC. Tracking the Hidden Epidemics Trends in STDs in the United States. Atlanta: CDC, 2000.
- [2] Weinstock H, Berman S, Cates W, Jr. Sexually transmitted diseases among American youth: Incidence and prevalence estimates, 2000. *Perspect Sex Reprod Health* 2004;36:6–10.
- [3] Young People at Risk: HIV AIDs Among America's Youth. 2004. Available at: <http://www.cdc.gov/hiv/pubs/facts/youth.htm>. Accessed November 4, 2004.
- [4] IOM. The Hidden Epidemic Confronting Sexually Transmitted Diseases. Washington, DC: National Academy Press, 1997.
- [5] Rosenberg PS, Biggar RJ, Goedert JJ. Declining age at HIV infection in the United States. *N Engl J Med* 1994;330:789–90.
- [6] STD Surveillance 2003. Available at: <http://www.cdc.gov/std/stats/toc2003.htm>. Accessed March 14, 2005.
- [7] Revised Guidelines for HIV Counseling, Testing, and Referral. *Morb Mortal Wkly Rep* 2001;50(RR19):1–58.
- [8] Halpern-Felsher BL, Ozer EM, Millstein SG, et al. Preventive services in a health maintenance organization: How well do pediatricians screen and educate adolescent patients? *Arch Pediatr Adolesc Med* 2000;154:173–9.
- [9] Torkko KC, Gershman K, Crane LA, et al. Testing for Chlamydia and sexual history taking in adolescent females: Results from a statewide survey of Colorado primary care providers. *Pediatrics* 2000;106:E32.
- [10] Ellen JM, Lane MA, McCright J. Are adolescents being screened for sexually transmitted diseases? A study of low income African American adolescents in San Francisco. *Sex Transm Infect* 2000;76:94–7.
- [11] Noell J, Glasgow RE. Interactive technology applications for behavioral counseling: Issues and opportunities for health care settings. *Am J Prev Med* 1999;17:269–74.
- [12] Kamb ML, Fishbein M, Douglas JM, Jr, et al. Efficacy of risk-reduction counseling to prevent human immunodeficiency virus and sexually transmitted diseases: A randomized controlled trial. Project RESPECT Study Group. *JAMA* 1998;280:1161–7.
- [13] Shain RN, Piper JM, Newton ER, et al. A randomized, controlled trial of a behavioral intervention to prevent sexually transmitted disease among minority women. *N Engl J Med* 1999;340:93–100.
- [14] O'Donnell CR, O'Donnell L, San Doval A, et al. Reductions in STD infections subsequent to an STD clinic visit. Using video-based patient education to supplement provider interactions. *Sex Transm Dis* 1998;25:161–8.
- [15] Kiene SM, Barta WD. A brief individualized computer-delivered sexual risk reduction intervention increases HIV/AIDS preventive behavior. *J Adolesc Health* 2006;39:404–10.
- [16] Noell J, Biglan A, Hood D, Britz B. An interactive videodisc-based smoking cessation program: Prototype development and pilot test. *Comput Hum Behav* 1994;10:347–58.
- [17] Brug J, Steenhuis I, van Assema P, et al. The impact of a computer-tailored nutrition intervention. *Prev Med* 1996;25:236–42.
- [18] Glasgow RE, La Chance PA, Toobert DJ, et al. Long-term effects and costs of brief behavioural dietary intervention for patients with diabetes delivered from the medical office. *Patient Educ Couns* 1997;32:175–84.
- [19] Glasgow RE, Toobert DJ, Hampson SE. Effects of a brief office-based intervention to facilitate diabetes dietary self-management. *Diabetes Care* 1996;19:835–42.
- [20] Metzger DS, Koblin B, Turner C, et al. Randomized controlled trial of audio computer-assisted self-interviewing: Utility and acceptability in longitudinal studies. HIVNET Vaccine Preparedness Study Protocol Team. *Am J Epidemiol* 2000;152:99–106.
- [21] Gross M, Holte SE, Marmor M, et al. Anal sex among HIV-seronegative women at high risk of HIV exposure. The HIVNET Vaccine Preparedness Study 2 Protocol Team. *J Acquir Immune Defic Syndr* 2000;24:393–8.
- [22] Kurth AE, Martin DP, Golden MR, et al. A comparison between audio computer-assisted self-interviews and clinician interviews for obtaining the sexual history. *Sex Transm Dis* 2004;31:719–26.
- [23] Turner CF, Ku L, Rogers SM, et al. Adolescent sexual behavior, drug use, and violence: Increased reporting with computer survey technology. *Science* 1998;280:867–73.
- [24] A Nation Online—How Americans are Expanding Their use of the Internet. Washington, DC: National Telecommunications And Information Administration. Economics and Statistics Administration, February 2002.
- [25] CDC. Technical guidance on HIV counseling. *MMWR Morb Mortal Wkly Rep* 1993(RR-2):11–7.
- [26] Glanz KRB, Lewis FM (eds). *Health Behavior and Health Education: Theory, Research and Practice*. 3rd edition. San Francisco: Jossey-Bass, 2002.
- [27] Fishbein M, Hennessy M, Kamb M, et al. Using intervention theory to model factors influencing behavior change. Project RESPECT. *Eval Health Prof* 2001;24:363–84.
- [28] CARE. Available at: www.ronline.com/care/. Accessed on March 2, 2006.
- [29] Liddicoat RV, Horton NJ, Urban R, et al. Assessing missed opportunities for HIV testing in medical settings. *J Gen Intern Med* 2004;19:349–56.
- [30] Gomez L, Egan D, Wheeler E, et al. How Interface Design Determines who has Difficulty Learning to use a Text Editor. In: SIGCHI Conference on Human Factors in Computing Systems, December 1983, Boston. New York: ACM Press, 1983:176–81.
- [31] Prochaska JO, Redding CA, Evers KE. The transtheoretical model and stages of change. In: Glanz K, Rimer BK, Lewis FM (eds). *Health Behavior and Health Education*. 3rd edition. San Francisco: Jossey-Bass, 2002:99–120.
- [32] Rogers EM. *Diffusion of Innovations*. 5th edition. New York: Free Press, 2003.